

FAST-TRACK REPORT

Pointing out new news, old news, and absent referents at 12 months of age

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Abstract

There is currently controversy over the nature of 1-year-olds' social-cognitive understanding and motives. In this study we investigated whether 12-month-old infants point for others with an understanding of their knowledge states and with a prosocial motive for sharing experiences with them. Declarative pointing was elicited in four conditions created by crossing two factors: an adult partner (1) was already attending to the target event or not, and (2) emoted positively or neutrally. Pointing was also coded after the event had ceased. The findings suggest that 12-month-olds point to inform others of events they do not know about, that they point to share an attitude about mutually attended events others already know about, and that they can point (already prelinguistically) to absent referents. These findings provide strong support for a mentalistic and prosocial interpretation of infants' prelinguistic communication.

Introduction

There is growing evidence that one-year-old infants understand other persons and are motivated to interact with them in much more complex ways than previously believed. Specifically, a number of different studies using a variety of different methodologies suggest (1) that infants as young as 12 months of age understand other persons as psychological agents who have goals and intentions, and who see, attend to, and know things and (2) that 1-year-old infants already have a uniquely human motive for sharing experiences with others (for a review of these studies see Tomasello, Carpenter, Call, Behne & Moll, 2005; Behne, Carpenter, Gräfenhain, Liebal, Liszkowski, Moll, Rakoczy, Tomasello, Warneken & Wyman, in press). Specifically, once infants understand that others have goals and intentions and perceive and attend to things, they begin participating with them in joint activities with shared goals and intentions and joint attentional engagement. Not all researchers agree on the proper interpretation of these findings, however, with a substantial number believing that 1-year-olds' behavior in the relevant experiments can be explained in much simpler ways, without attributing to them such sophisticated social-cognitive understanding and motives (e.g. Carpendale & Lewis, 2004; Moore & Corkum, 1994).

A behavior of particular importance in both these regards is declarative pointing, which emerges around infants' first birthdays and is notably absent in apes and in children with autism (e.g. Tomasello & Camaioni, 1997). Since its initial description in the modern context by Bates, Camaioni and Volterra (1975), declarative pointing has been assumed by many researchers to be a case of infants directing others' attention to something new (revealing an understanding of others' attention or knowledge), and doing so in order to share interest or some other psychological state with them (revealing a motive for sharing experiences). However, some researchers have suggested that this 'mentalistic' and prosocial interpretation of 12-month-olds' declarative pointing is not warranted (e.g. Carpendale & Lewis, 2004; Desrochers, Morrissette & Ricard, 1995; Gomez, Sarria & Tamarit, 1993; Moore & Corkum, 1994). For example, Moore and D'Entremont (2001) reported that infants pointed at events independently of whether an adult was already attending to these events, suggesting that infants did not systematically point to direct the adult's attention to the events and inform her of something new. Moore and D'Entremont (2001) therefore proposed that infant declarative pointing initially does not involve an understanding of others' attention or knowledge and is motivated egocentrically, to obtain a

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positive emotional response to the self only (see also Bates *et al.*, 1975).

Liszkowski (2006), however, argued that it is important in interpreting this finding to recall that declarative pointing has not only the function of directing others' attention but in addition an underlying motive for sharing attitudes about the referent with others. For example, if one person is already attending to something, another person may still point to it if she wants to make mutually manifest her interest in it and her desire to share the same attitude toward it. Thus, although infants may sometimes point to direct others' attention to something new (see Legerstee & Barillas, 2003, Experiment 2), in addition infants may sometimes be just as motivated to point in order to manifest and share their interest about something already known – which may be what infants were doing in Moore and D'Entremont's study.

Liszkowski's account is empirically supported by the findings of several recent studies of 12-month-olds' pointing. First, in a search context in which an adult is looking for an object, 12-month-olds point out the location for her (Liszkowski, Carpenter, Striano & Tomasello, 2006a). In other contexts, infants show that it is important to them that the adult's attention is directed to the *specific* referent they are pointing to, and not just something else nearby (Liszkowski, Carpenter & Tomasello, 2006b). These findings suggest that infants thus point to direct others' attention to external objects or events, at least sometimes to inform them of something they do not know. Further findings show that declarative pointing is in addition motivated by sharing attention and interest with others. In a study in which infants' pointing was elicited by interesting events and the experimenter's reaction to infants' pointing was systematically varied, infants showed by their patterns of repeated pointing that they were satisfied with the experimenter's reaction only when she responded by sharing attention and interest about the event. They were less satisfied when she attended and emoted only to infants themselves or attended only to the event (Liszkowski, Carpenter, Henning, Striano & Tomasello, 2004). In a similar study, infants selectively preferred positive over neutral comments, indicating that with their pattern of repeated pointing they were inviting the adult to share their particular attitude of interest about the event, as opposed to trying to request information or simply elicit positive emotions (Liszkowski *et al.*, 2006b).

However, with regard to infant social-cognitive understanding of others' knowledge states, although there were other controls, the study by Liszkowski *et al.* (2006a) did not include a direct comparison between an adult who knew versus did not know the location of the object, and in the other studies one possible interpretation of

the findings is that infants' understanding of others' attention may be limited to ongoing interactions and the reactions infants receive, because the experimental manipulation always began *after* infants had already pointed. Thus, it may be that infants consider others' attention only situationally, instead of understanding persons more generally as agents with knowledge states (see also Franco & Butterworth, 1996, who reported that 12-month-olds do not consider a recipient's state of attention before they point). Further, with regard to infants' motive for sharing interest in an event, the findings regarding positive versus neutral comments could possibly be explained by a general 'mood contagion' effect instead of an understanding of the adult's emoting as an expression of her referential attitude. Finally, another open question is whether infant pointing already is a fully communicative act involving an understanding of mental states. If, for example, infants could already point to locations of physically absent referents (like adults do), this would make non-mentalistic interpretations of infant pointing particularly difficult. Infants older than 12 months can comprehend adults' verbal reference to absent things (Ganea, 2005; Saylor & Baldwin, 2004) and Saylor (2004) has presented some suggestive evidence that in response to adults' labels of absent things infants may sometimes gesture to their previous locations (however, in that study gesturing to absent referents was very rare for the 12-month-olds and did not exceed a baseline level, see p. 606, Table 2). The best evidence available for infants' production of communication about absent referents is with older infants and mostly in speech (e.g. Huttenlocher, 1974; Sachs, 1983), but as yet there have been no systematic studies of prelinguistic 12-month-olds' spontaneous production of *gestures* about absent referents.

The current study systematically investigated these three aspects of declarative pointing – directing attention to a referent, sharing an attitude about the referent, and communicating about absent referents – with all these issues in mind. In particular, we asked whether infants, *before* they point, consider what is unknown to a person; whether they consider a person's attitude about a known event; and whether they would point to the location of an event after it had already disappeared. In the current experimental design, in a first phase, (1) the experimenter (E) either attended to an interesting event or to another location (alternating gaze with the infant), and, crossed with this, (2) E either emoted positively or neutrally. There was then a second phase after the event had ceased and the referent had disappeared in which E simply attended to the infant.

One hypothesis was that infants would want to inform E about events that were new for her. On this *Informing*

hypothesis we predicted that infants would point more to the event when E was attending to the other location than when she was attending to the event (main effect of informing). A second hypothesis was that infants would also want to share interest about the event with E. On this *Sharing* hypothesis we predicted that when E attended to the event, infants would point more when E emoted positively than neutrally, in order to make their interest in the event manifest too and so share this with E (selective effect of sharing). In addition, we expected that when E attended instead to the other location, infants would point equally often for both types of E's emotions, because these emotions did not refer to the event (no effect of general mood contagion). Further, we investigated whether infants would point in both phases, when the referent event was still happening and when it had already ceased, and whether their pointing in the second phase would be mediated by E's previous reactions. If so, this would reveal an ability to communicate about physically absent referents – which would provide additional evidence that infants' declarative pointing is truly communicative and directed at the psychological states of others.

Method

Participants

Infants were recruited from a database of parents who had agreed to participate in infant studies. Forty-three infants (mean age 12;17, range 12;02 to 13;13; 18 boys and 25 girls) were included in the experiment. An additional four infants were tested but excluded because of fussiness (two) or experimenter error (two). Infants were randomly assigned to one of two experimental groups (positive emotion group, $N = 24$; neutral emotion group, $N = 19$).

Materials

A white cloth screen (2×2.10 m) stood blocking the back of the testing room. It had two window openings at a height of approximately 90 cm on its left and right side (each at a distance of approximately 90 cm from the middle of the screen), through which a hidden assistant (E2) could protrude hand-puppets. Four different puppets were used as stimuli. Infants sat on their mother's lap at a small table facing a female experimenter (E) and the screen. E sat approximately 1 meter in front of the screen, and the infant sat approximately 2.5 meters in front of the screen. Two cameras recording infants from the front, one camera recording from above, and

one camera recording E from the front were fed into a quad-splitter.

Procedure

Mothers were instructed not to talk or initiate contact with their infants during the testing session. There were four trials for each infant. On each trial E turned to one side and looked at one of the two windows. At that same moment, E2 protruded a puppet through one of the windows and moved it around for 20 seconds. On two trials E turned to the window through which the puppet protruded and attended to the puppet (*attend event* condition, see Figure 1a). On the other two trials E instead turned to the opposite, closed window and did not attend to the puppet (*attend screen* condition, see Figure 1b). The two trials in each condition were blocked, and the order of conditions was counterbalanced across infants. E attended and emoted either about the puppet or the blank screen and looked back to the child twice during this time (*referent present* phase). Infants were randomly assigned to one of two experimental groups. In the *positive emotion* group E emoted positively, saying with a happy, slightly high-pitched voice something like 'Oh, there is a [type of puppet]/nothing! . . . That is really great! . . . How nice!' In the *neutral emotion* group E emoted disinterestedly, saying with a neutral tone of voice something like 'Oh, there is a [type of puppet]/nothing. . . . That is boring. . . . Hm, well, not interesting!' At the end of that 20 seconds, after the puppet disappeared, E turned back to infants and faced them for another 20 seconds (*referent absent* phase, see Figure 1c), smiling pleasantly and saying something like 'Yes, that's how it goes. . . . Hm. . . . There was something/nothing, hm? . . . We'll be done in just a moment.' After that time had elapsed, E proceeded to the next trial.

Coding and analyses

From the videotapes, a coder who was blind to the hypotheses of the study coded the number of infants' points which began in the *referent present* and in the *referent absent* phases. A point was coded when infants extended their arm (either fully or slightly bent) and index finger or hand in the direction of the stimulus. It lasted until the arm was withdrawn (either fully or more than half). Only points to the puppets or to the empty window where the puppet previously had been on that trial were analyzed. Infants never pointed to the other screen. We analyzed as dependent measures the *number of points per condition* and the *number of infants who pointed at least once per condition*. We used a mixed design with condition and phase as within-subject factors and

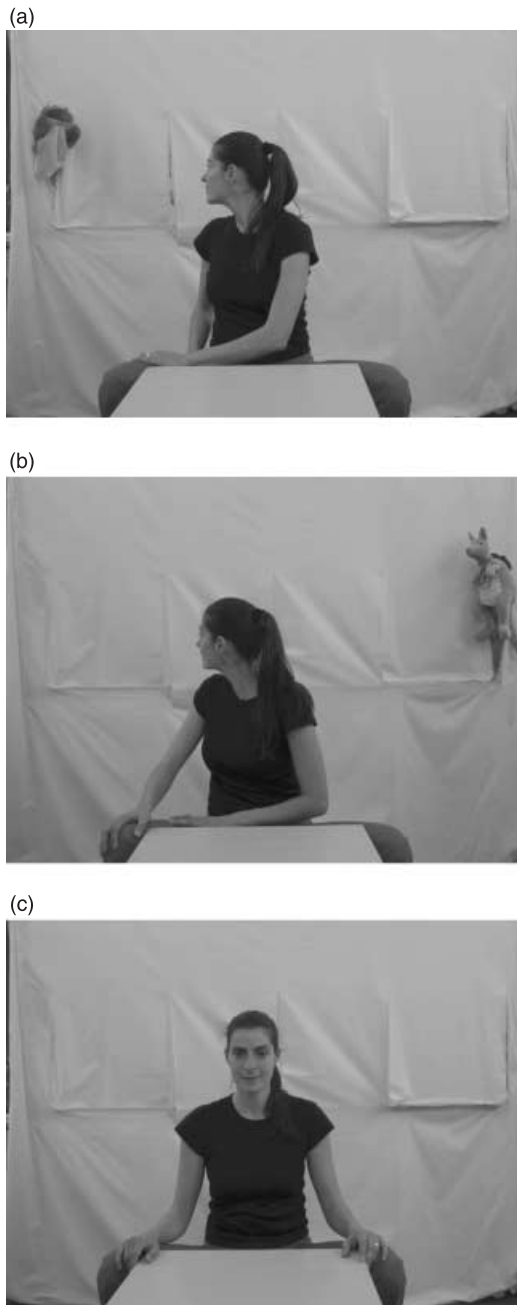


Figure 1 *Experimenter's behavior from the infant's view.*
 (a): Referent present phase, attend event condition;
 (b): Referent present phase, attend screen condition;
 (c): Referent absent phase for both conditions.

emotion as between-subjects factor. To assess inter-observer reliability, all the videotapes were recoded by a coder who was blind to the hypotheses of the study. Reliability was excellent: coders' judgments of number of points for each child in each phase were highly

correlated and not different from each other (Pearson's $r_s > .994$, $p_s < .001$; p_s of t -tests $> .500$).

Results

First, we tested for effects of condition, phase and emotion with an overall 2 (*attend event, attend screen*) $\times 2$ (*referent present, absent*) $\times 2$ (*neutral, positive emotion*) ANOVA (for means and standard errors see Figure 2). There was a main effect of condition such that infants pointed significantly more to the event in the *attend screen* condition when E did not attend to the event than in the *attend event* condition when she did ($F(1, 41) = 11.13$, $p = .002$). Further, there was a significant interaction of condition and phase ($F(1, 41) = 4.42$, $p = .042$), indicating that the condition effect was different between the two phases, and a three-way interaction of condition, phase and emotion ($F(1, 41) = 3.75$, $p = .060$), indicating that emotion had a selective effect on condition and phase. To investigate the interactions with regard to our hypotheses and predictions in detail, we analyzed simple effects (Fisher's LSD) for condition, emotion and phase separately.

In the *referent present* phase (see left panel of Figure 1), results regarding both measures supported our informing hypothesis. Infants in both the *neutral* and the *positive emotion* groups pointed significantly more often to the event in the *attend screen* condition than in the *attend event* condition (main effect of informing; $p = .023$ and $p < .001$, respectively, one-tailed). In addition, significantly more infants pointed at least once in the *attend screen* than the *attend event* condition overall ($N = 26$ and 17 , respectively; McNemar's *exact* $p = .018$,

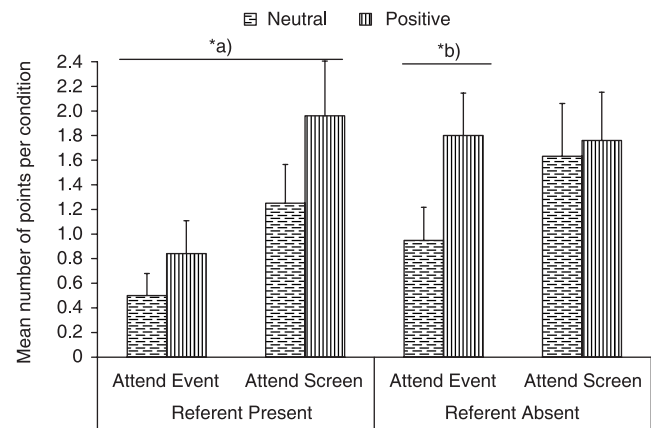


Figure 2 *Mean frequency of pointing (and SE) for each condition, emotion group and response phase. *a) main effect of informing, $p < .05$; *b) selective effect of sharing, $p < .05$.*

Table 1 Number of infants who did or did not point in the Referent Present phase as a function of condition and emotion group

| | | Attend screen | |
|--------------|------------------------------|------------------------------|---------------------------|
| | | No point (neutral; positive) | Point (neutral; positive) |
| Attend event | No point (neutral; positive) | 7; 7 | 5; 7 |
| | Point (neutral; positive) | 1; 2 | 6; 8 |

Table 2 Number of infants who did or did not point in the Referent Absent phase as a function of condition and emotion group

| | | Attend screen | |
|--------------|------------------------------|------------------------------|---------------------------|
| | | No point (neutral; positive) | Point (neutral; positive) |
| Attend event | No point (neutral; positive) | 7; 7 | 4; 1 |
| | Point (neutral; positive) | 2; 2 | 6; 14 |

one-tailed). For this measure, there was no significant effect of condition for each emotion group separately (both $ps > .180$; see Table 1). Infants thus pointed in this first phase primarily to attempt to inform E of what was new to her.

In the *referent absent* phase (see right panel of Figure 2), one main finding was that infants did indeed point to the location where the event had taken place previously. The majority of infants (67%) did this at least once overall. Forty-four percent of infants pointed only in the *referent absent* phase and not before (in the *attend event* condition 33% of infants in the *positive emotion* group and 26% of infants in the *neutral emotion* group; in the *attend screen* condition 13% and 16% of infants, respectively).

In this phase, both condition and emotion had an effect on infants' pointing. First, findings again supported our informing hypothesis: Infants in the *neutral emotion* group pointed more often to the location of the absent referent when E had not attended to it than when she had ($p = .042$, one-tailed), presumably to inform her that there had been something worth sharing or showing interest in before. (For the measure number of infants who pointed, there was no statistically significant difference between conditions; this was also the case for both emotion groups separately, all $ps > .600$; see Table 2). In addition, findings also supported our sharing hypothesis: Emotion had a selective effect such that when E had *attended* to the event (but not when she had *not attended*), infants pointed significantly more often to the location of the absent referent when E had emoted positively than neutrally (selective effect of sharing; $p = .022$, one-tailed). In fact, when E had attended and emoted positively, infants pointed significantly more often in the *referent absent* than the *referent present* phase ($p = .009$, two-tailed). For the number of infants there was also a tendency that more infants from the *attend event* condition pointed at least once in the *positive*

than in the *neutral* emotion group (67% vs. 42%, Fisher's *exact* $p = .096$, one-tailed). Thus, in this second phase infants pointed to the location of the absent referent either to inform or to share, depending on what E had seen and how she had reacted before.

Discussion

This study investigated infant declarative pointing at 12 months, when it has just emerged, with regard to its underlying social-cognitive understanding and motive to share experiences with others. Findings were that infants pointed declaratively both to inform others about new things and with the motive of sharing attitudes about things they attended to mutually with others. Furthermore, this study provides the first experimental evidence that 12-month-old infants also point to the locations of absent referents.

More specifically, with regard to our informing hypothesis the main finding was that infants understood what was new to others and what was not. Infants pointed more often to an interesting event when the adult was not attending to it (i.e. when she was attending elsewhere, to something not so interesting) than when she was attending to the interesting event. Thus, contrary to Moore and D'Entremont's (2001) hypothesis, infants do use their declarative pointing in an attempt to direct a person's attention to something to which she is currently not attending (see also Legerstee & Barillas, 2003; Liszkowski *et al.*, 2004, 2006b). This interpretation is supported by the recent finding that 12-month-olds in a different context also point to inform others in order to help them find something they are looking for, and is consistent with the idea that infants understand that persons may sometimes lack specific information (Liszkowski *et al.*, 2006a). The current finding is also

consistent with recent studies using other paradigms that suggest that infants understand others' attention and knowledge states in the first half of the second year (e.g. Onishi & Baillargeon, 2005; Tomasello & Haberl, 2003).

With regard to our sharing hypothesis, we found that when the adult was already attending to the event infants sometimes still pointed to it. Moore and D'Entremont (2001) interpreted a similar finding in their study as evidence that infants did not point to direct others' attention. We believe, in contrast, that this shows that apart from directing others' attention (see informing results above) infants in addition point declaratively with the motive of sharing an attitude about a referent that is attended to mutually. Support for our view comes from our finding that in the second phase of the response period, infants pointed more often when the adult had previously expressed interest in the event than when she had expressed disinterest, presumably because it was only then that they would be able to manifest the mutual sharing of interest in the event with the adult. Note that it was not the case that infants simply generally pointed more when the adult reacted with positive emotion – when the adult was not aware of the event, her emoting did not influence infants' pointing – thus excluding a general effect of mood contagion. This suggests that infants understand people's emoting as an expression of their attitude about a specific referent (see Liszkowski *et al.*, 2006b; Moses, Baldwin, Rosicky & Tidball, 2001, for further support for the idea that 12-month-olds interpret others' emotional responses as selectively referring to specific objects). We believe that the finding that infants point at interesting events that a person is already aware of and expresses interest in suggests that, in addition to directing others' attention to new and interesting things, infants also use declarative pointing to mutually manifest the sharing of an attitude about a referent. This interpretation is consistent with reports that in gaze-following studies infants sometimes point to the object to which they have just followed the adult's gaze (Brooks & Meltzoff, 2002; Carpenter, Nagell & Tomasello, 1998). In the current study, it is possible that infants did this more often in the referent absent than the referent present phase because the adult was turned toward infants and thus more available to infants in this second phase.

A further important finding was that 12-month-old infants already communicate beyond the immediate here and now, as evidenced by their ability to refer to the locations of events which had already ceased. A full two-thirds of infants pointed during the second, referent absent phase of the response period. Importantly, from the overall pattern of results it is clear that infants were not doing something simple like just extending their

pointing into the second phase, since some infants had pointed to the visible referent before but some not, and their pointing was still mediated by what E had seen and how she had reacted previously. This is the first experimental study we are aware of which shows that 12-month-old infants' prelinguistic, spontaneous gestural communication does not depend on the physical presence of a perceptible referent. This finding thus provides additional support for the interpretation that infant declarative pointing when it has just emerged is already a fully communicative act involving an understanding of mental states, as the absent communicative referent must be imagined.

In the current controversy over what 1-year-old infants understand about others' psychological states, the current study of 12-month-olds' declarative pointing provides strong support for a mentalistic interpretation. Findings revealed that infants understand others as persons who have psychological relations toward the environment with specific knowledge states and attitudes about it. The current study also provides strong support for a prosocial interpretation of infants' motives. Findings revealed that infants have a motive for sharing psychological relations toward the environment with others, actively attempting to align others' attention with their own and to signal alignment of their own interest with that of others. Together, social-cognitive understanding and prosocial motives provide the basis for fully human communication, including reference to absent things, even before language has emerged, which is consistent with social-pragmatic theories of language acquisition (see Bruner, 1983; Tomasello, 2003). The current study thus demonstrates an understanding of persons as mental beings, prosocial motives for interacting with them cooperatively, and the ability for displaced communication – all before language has emerged, and all in the humble act of pointing.

Acknowledgements

Thanks to Elena Rossi, Jana Hausbek and Marie Schäfer for coding and helping with the data collection.

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Received: 31 July 2006

Accepted: 21 August 2006